Operating instructions
Electronic pressure sensor
PI27xx
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1 Preliminary note

1.1 Symbols used

► Instructions

> Reaction, result

[...] Designation of pushbuttons, buttons or indications

→ Cross-reference

⚠ Important note

Non-compliance can result in malfunction or interference.

Information

Supplementary note.

2 Safety instructions

• Please read this document prior to set-up of the unit. Ensure that the product is suitable for your application without any restrictions.

• If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property can occur.

• Check the compatibility of the product materials (→ chapter 12 Technical data) with the media to be measured in all applications.

For the scope of validity cULus:

The device shall be supplied from an isolating transformer having a secondary Listed fuse rated either

a) max 5 amps for voltages 0~20 Vrms (0~28.3 Vp) or

b) 100/Vp for voltages of 20~30 Vrms (28.3~42.4 Vp).

The Sensor shall be connected only by using any R/C (CYJV2) cord, having suitable ratings.
3 Functions and features

The unit measures and monitors the system pressure in a plant.

3.1 Applications

Type of pressure: relative pressure

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Measuring range</th>
<th>Permissible overpressure</th>
<th>Bursting pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bar PSI</td>
<td>bar PSI bar PSI</td>
<td></td>
</tr>
<tr>
<td>PI2793</td>
<td>-1...25 -14.4...362.7</td>
<td>100 1450 350 5075</td>
<td></td>
</tr>
<tr>
<td>PI2794</td>
<td>-1...10 -14.5...145</td>
<td>50 725 150 2175</td>
<td></td>
</tr>
<tr>
<td>PI2795</td>
<td>-1...4 -14.5...58</td>
<td>30 435 100 1450</td>
<td></td>
</tr>
<tr>
<td>PI2796</td>
<td>-0.124...2.5 -1.8...36.27</td>
<td>20 290 50 725</td>
<td></td>
</tr>
<tr>
<td>PI2797</td>
<td>-0.05...1 -0.73...14.5</td>
<td>10 145 30 435</td>
<td></td>
</tr>
<tr>
<td>PI2799</td>
<td>-1...1 -14.5...14.5</td>
<td>10 145 30 435</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mbar inH2O bar inH2O</td>
<td>bar inH2O bar inH2O</td>
<td></td>
</tr>
<tr>
<td>PI2798</td>
<td>-12.4...250 -5.0...100.4</td>
<td>10 4015 30 12044</td>
<td></td>
</tr>
<tr>
<td>PI2789</td>
<td>-5...100 -2.00...40.16</td>
<td>4 1606 30 12044</td>
<td></td>
</tr>
</tbody>
</table>

Avoid static and dynamic overpressure exceeding the given overload pressure by taking appropriate measures.
The indicated bursting pressure must not be exceeded.
Even if the bursting pressure is exceeded only for a short time, the unit may be destroyed. ATTENTION: Risk of injury!

Not suitable for use where the criteria for paragraph D10.1.2/74-03 of the 3A standard 74-03 have to be met.

4 Function

- The unit displays the current system pressure.
- It generates output signals according to the operating mode and the parameter setting.
- It moreover provides the process data via IO-Link.
- The unit is laid out for fully bidirectional communication. So, the following options are possible:
  - Remote display: reading and display of the current system pressure.
  - Remote parameter setting: reading and changing the current parameter setting.
- Using the FDT service program ifm Container, the current parameter settings can be stored and transferred to other units of the same type. The program library of the available DTM objects can be found at www.ifm.com → Service → Download. Device-specific parameter lists for IO-Link parameter setting are available at: www.ifm.com

4.1 Operating modes
The operating mode is defined by the wiring (→ 6 Electrical connection) and automatically recognised.

4.1.1 2-wire operation

| OUT2 (pin 2) | analogue signal proportional to pressure 4…20 mA or 20…4 mA |

4.1.2 3-wire operation

| OUT1 (pin 4) | • switching signal for system pressure limit value  
• communication via IO-Link |
| OUT2 (pin 2) | 3 options:  
• switching signal for system pressure limit value  
• analogue signal proportional to pressure 4…20 mA  
• analogue signal proportional to pressure 20…4 mA |

4.2 Switching function (only for 3-wire operation)
OUTx changes its switching state if it is above or below the set switching limits (SPx, rPx). The following switching functions can be selected:
• Hysteresis function / normally open: \([\text{OU}x] = [\text{Hno}]\) (→ fig. 1).
• Hysteresis function / normally closed: \([\text{OU}x] = [\text{Hnc}]\) (→ fig. 1).
First the set point (SPx) is set, then the reset point (rPx) with the requested difference.
• Window function / normally open: \([\text{OU}x] = [\text{Fno}]\) (→ fig. 2).
• Window function / normally closed: \([\text{OU}x] = [\text{Fnc}]\) (→ fig. 2).
The width of the window can be set by means of the difference between SPx and rPx. SPx = upper value, rPx = lower value.
4.3 Analogue function

The analogue output can be configured.

• [OU2] defines whether the set measuring range is provided as 4...20 mA ([OU2] = [I]) or as 20...4 mA ([OU2] = [InEG]).

Scaling can be set by means of the teaching process or by entering a value for the ASP and AEP parameters.

• Teaching the analogue start point [tASP] or setting the parameter [ASP] defines at which measured value the analogue signal is 4 mA (20 mA at [InEG]).
• Teaching the analogue end point [tAEP] or setting the parameter [AEP] defines at which measured value the output signal is 20 mA (4 mA at [InEG]).
Minimum distance between [ASP] and [AEP] = 25 % of the final value of the measuring range (turn-down 1:4); for PI2799: 25 % of the measuring span.

<table>
<thead>
<tr>
<th>Factory setting</th>
<th>Measuring range scaled</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
</tbody>
</table>

P = system pressure, MAW = initial value of the measuring range, MEW = final value of the measuring range

1: [OU2] = [I]; 2: [OU2] = [InEG]

In the set measuring range the output signal is between 4 and 20 mA ([OU2] = [I]) or between 20 and 4 mA ([OU2] = [InEG]).

It is also indicated:

- System pressure above the measuring range:
  - Output signal > 20 mA at [OU2] = [I].
  - Output signal 4 to 3.8 mA at [OU2] = [InEG].
- System pressure below the measuring range:
  - Output signal 4 to 3.8 mA at [OU2] = [I].
  - Output signal > 20 mA at [OU2] = [InEG].
4.4 Customer-specific calibration

The customer-specific calibration changes the curve of measured values compared to the real measured values (shifting / change of the gradient; → 9.4.6 [CAL]).

- Two calibration points can be defined (CP1, CP2). The two points are independent of each other.
- The two calibration points must be within the scaled measuring range (→ 4.3 Pressure monitoring / analogue function).
- The zero point calibration [COF] influences the calibration of the curve of measured values. Recommendation: set [COF] to 0 (→ 9.4.1 [COF]), then calibrate the curve of measured values.

After a change the calibration can be reset to factory setting (→ 9.5.2 [rES]).

\[ P = \text{measured pressure}; \]
\[ P' = \text{modified measured value} \]
\[ CP1 = \text{calibration point 1}; \]
\[ CP1' = \text{modified measured value for CP1} \]
\[ CP2 = \text{calibration point 2}; \]
\[ 1 = \text{curve of measured values at factory setting} \]
\[ 2 = \text{curve of measured values after calibration} \]

\[ P = \text{measured pressure}; \]
\[ P' = \text{modified measured value} \]
\[ CP1 = \text{calibration point 1}; \]
\[ CP2 = \text{calibration point 2}; \]
\[ CP2' = \text{modified measured value for CP2} \]
\[ 1 = \text{curve of measured values at factory setting} \]
\[ 2 = \text{curve of measured values after calibration} \]
5 Installation

⚠ Before installing and removing the unit: make sure that no pressure is applied to the system. Please consider when the system pressure is displayed in % of the span: “0” does not mean that no pressure is applied to the system!

Use in hygienic areas to 3A
Orientation of the unit in pipes and tanks

For optimised cleaning of the measuring element according to the 3A criteria for hygienic areas please take the following into account:

Do not install the unit at the lowest point of the pipe or tank (see fig., position 5) in order that the medium can run off the area of the measuring element.

Use in hygienic areas to EHEDG

► Make sure that the sensors are integrated into the system in accordance with EHEDG.

The unit can be fixed to different process connections. Options are as follows:
1 Installation using an adapter with sealing ring (order no. E332xx / E333xx)
The adapters are supplied with EPDM O-ring (order no. E30054). More sealing rings are available as accessories: FKM O-ring (order no. E30123); PEEK sealing ring (order no. E30124).
Concerning installation → Installation instructions attached to the adapter.

2 Installation using an adapter with metal-to-metal seal
Order no. E337xx / E338xx
Concerning installation → Installation instructions attached to the adapter.

3 Installation using a welding adapter
- Order no. E30122
- Order no. E30130; adapter with leakage port
The adapters are supplied with EPDM O-ring (order no. E30054). More sealing rings are available as accessories: FKM O-ring, order no. E30123.
Concerning installation → Installation instructions attached to the adapter.

4 Installation to G 1 flange
The sealing ring on the sensor is used as process seal.
The upper sealing area on the process connection must be flush with the tapped hole and have a surface characteristic of min. Rz 6.3.
▶ Grease the sensor thread with a suitable paste.
▶ Insert the unit into the process connection.
▶ Tighten it using a spanner. Tightening torque: 35 Nm.

6 Electrical connection
⚠️ The unit must be connected by a qualified electrician.
The national and international regulations for the installation of electrical equipment must be adhered to.
Voltage supply according to EN 50178, SELV, PELV.

▶ Disconnect power.
▶ Connect the unit as follows:

6.1 Connection for 2-wire operation
6.2 Connection for IO-Link parameter setting

<table>
<thead>
<tr>
<th>Pin 1</th>
<th>Ub+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 2</td>
<td>Output function according to the OU2 setting</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Ub- for programming mode</td>
</tr>
<tr>
<td>Pin 4 (P)</td>
<td>Communication via IO-Link</td>
</tr>
</tbody>
</table>

6.3 Connection for 3-wire operation

<table>
<thead>
<tr>
<th>2 x positive switching</th>
<th>2 x negative switching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Ub+</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Ub-</td>
</tr>
</tbody>
</table>
| Pin 4 (OUT1) | • Binary switching output pressure monitoring  
• Communication via IO-Link |
| Pin 2 (OUT2) | Binary switching output pressure monitoring or analogue output for system pressure |
### 7 Operating and display elements

**1 to 8: Indicator LEDs**
- LED 1 to LED 5 = system pressure in the specified unit of measurement.
- LED 6 = System pressure in % of the set scaling of the analogue output if [OU2] is configured as analogue output.
  
  System pressure in % of the final value of the measuring range if [OU2] is configured as switching output.
- LED 7 = switching status OUT2 (lights if output 2 is switched).
- LED 8 = switching status OUT1 (lights if output 1 is switched)

**9: Alphanumeric display, 4 digits**
- Display of the current system pressure.
- Indication of the parameters and parameter values.

**10: Set pushbutton**
- Setting of the parameter values (scrolling by holding pressed; incrementally by pressing once).

**11: Mode/Enter button**
- Selection of the parameters and acknowledgement of the parameter values.
8 Menu

8.1 Menu structure: main menu

1: Change to menu level 2 (extended functions)
Menu items highlighted grey (SP1) are not active in 2-wire operation.
### 8.2 Explanation of the main menu

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1/rP1*</td>
<td>Upper / lower limit value for system pressure at which OUT1 switches.</td>
</tr>
<tr>
<td>OU1*</td>
<td>Output function for OUT1:</td>
</tr>
<tr>
<td></td>
<td>• Switching signal for the pressure limit values: hysteresis function [H ..]</td>
</tr>
<tr>
<td></td>
<td>or window function [F ..], either normally open [. no] or normally closed [. nc].</td>
</tr>
<tr>
<td>OU2</td>
<td>Output function for OUT2:</td>
</tr>
<tr>
<td></td>
<td>• Switching signal for the pressure limit values: hysteresis function [H ..]</td>
</tr>
<tr>
<td></td>
<td>or window function [F ..], either normally open [. no] or normally closed [. nc];</td>
</tr>
<tr>
<td></td>
<td>(only available for 3-wire operation).</td>
</tr>
<tr>
<td></td>
<td>• Analogue signal for the current system pressure: 4...20 mA [I], 20...4 mA [InEG].</td>
</tr>
<tr>
<td>tCOF</td>
<td>Teach zero-point calibration.</td>
</tr>
<tr>
<td>tASP</td>
<td>Teach analogue start point for system pressure: set measured value at which</td>
</tr>
<tr>
<td></td>
<td>4 mA is provided (20 mA if [OU2] = [InEG]).</td>
</tr>
<tr>
<td>tAEP</td>
<td>Teach analogue end point for system pressure: set measured value at which</td>
</tr>
<tr>
<td></td>
<td>20 mA is provided (4 mA if [OU2] = [InEG]).</td>
</tr>
<tr>
<td>SP2/rP2*</td>
<td>Upper / lower limit value for system pressure at which OUT2 switches.</td>
</tr>
<tr>
<td>EF</td>
<td>Extended functions / opening of menu level 2.</td>
</tr>
</tbody>
</table>

* menu items not active in 2-wire operation
1: Change to the main menu; 2: Change to menu level 3 (simulation)
Menu items highlighted grey ([ASP]) are not active in 2-wire operation.
## 8.4 Explanation of the menu level 2

<table>
<thead>
<tr>
<th>Menu Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uni</td>
<td>Standard unit of measurement for system pressure.</td>
</tr>
</tbody>
</table>
| SELd      | Display mode:  
• Pressure in the unit set in [Uni].  
• Pressure in % of the set scaling of the analogue output. |
| ASP       | Analogue start point for system pressure: measured value at which 4 mA is provided (20 mA if [OU2] = [InEG]). |
| AEP       | Analogue end point for system pressure: measured value at which 20 mA is provided (4 mA if [OU2] = [InEG]). |
| HI        | Maximum value memory for system pressure. |
| LO        | Minimum value memory for system pressure. |
| COF       | Zero-point calibration. |
| dS1*      | Switch-on delay for OUT1. |
| dr1*      | Switch-off delay for OUT1. |
| dS2*      | Switch-on delay for OUT2; only active if [OU2] = [Hnc], [Hno], [Fnc] or [Fno]. |
| dr2*      | Switch-off delay for OUT2; only active if [OU2] = [Hnc], [Hno], [Fnc] or [Fno]. |
| FOU1*     | Behaviour of output 1 in case of an internal fault. |
| FOU2      | Behaviour of output 2 in case of an internal fault. |
| P-n*      | Switching logic for the outputs: pnp or npn. |
| dAP       | Damping for switching outputs and display. |
| dAA       | Damping for analogue output (OUT2); also has effect on the IO-Link process value. |
| diS       | Update rate and orientation of the display. |
| CAL       | Calibration function (setting the curve of measured values). |
| CP1       | Calibration point 1 |
| CP2       | Calibration point 2 |
| SIM       | Change to menu level 3 (simulation) |
| rES       | Restore factory settings. |

* menu items not active in 2-wire operation
8.5 Menu structure: level 3 (simulation)

For setting SEL = OU

For setting SEL = Proc

2: Change to menu level 2 (extended functions)
Menu items highlighted grey (S.OU1) are not active in 2-wire operation.
## 8.6 Explanation of the menu level 3

| SEL | Status to be simulated:  
|     | • Output functions [OU]. |
| S.OU1* | Simulation values for OUT1; only active for 3-wire operation and if [SEL] = [OU].  
|       | • Output inactive [OPEN] or output active [CLOS]. |
| S.OU2 | Simulation values for OUT2; only active if [SEL] = [OU].  
|       | • For 3-wire operation and if OUT2 has been configured as switching output: output inactive [OPEN] or active [CLOS].  
|       | • If OUT2 is set as analogue output: analogue signal between 3.6 and 21.1 mA (depending on the set value → 9.6.2). |
| S.TIM | Time for the simulation process in minutes. |
| S.ON  | Start of the simulation process.  
|       | During the simulation process the display alternately shows [SIM] and the current operation indication (9.6.4).  
|       | If the simulation process is aborted (press [Mode/Enter] or [Set] briefly), [S.OFF] is indicated for 2 s, then [SEL] is active again. |

* menu item not active in 2-wire operation

| SEL | Status to be simulated:  
|     | • Process value [Proc]. |
| S.Pr | Simulation of a process value; only active if [SEL] = [Proc].  
|       | • Any value between initial value of the measuring range and final value of the measuring range. |
| S.TIM | Time for the simulation process in minutes. |
| S.ON  | Start of the simulation process.  
|       | During the simulation process the display alternately shows [SIM] and the current operation indication (→ 9.6.4).  
|       | If the simulation process is aborted (press [Mode/Enter] or [Set] briefly) [S.OFF] is indicated for 2 s, then [SEL] is active again. |
## 9 Parameter setting

During parameter setting the unit remains in the operating mode. It continues its monitoring function with the existing parameters until the parameter setting has been completed.

Exceptions: changes to the parameters COF (→ 9.4.1), CP1 and CP2 (→ 9.4.7) take effect immediately.

### 9.1 General parameter setting

3 steps must be taken for each parameter setting:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
</table>
| 1    | **Select parameter**  
|      | ➤ Press [Mode/Enter] until the requested parameter is displayed.  
|      | ➤ Press [Set] and keep it pressed until the valid code no. is displayed.  
| 2    | **Set parameter value**  
|      | ➤ Press [Set] and keep it pressed.  
|      | ➤ Current setting value of the parameter flashes for 5 s.  
|      | ➤ After 5 s: setting value is changed: incrementally by pressing the button once or continuously by keeping the button pressed.  
|      | Numerical values are incremented continuously. For reducing the value: let the display move to the maximum setting value. Then the cycle starts again at the minimum setting value. |
| 3    | **Acknowledge parameter value**  
|      | ➤ Press [Mode/Enter] briefly  
|      | ➤ The parameter is displayed again. The new setting value is stored. |

Set other parameters  
➤ Start again with step 1.

Finish parameter setting  
➤ Press [Mode/Enter] several times until the current measured value is displayed or wait for 15 s.  
➤ The unit returns to the operating mode.
For 2-wire operation those menu items referring to switching functions are not active (→ 8 Menu structure); for some menu items those parameter values referring to switching functions cannot be selected.

• If [SLoc] is displayed when attempting a modification of a parameter value, the sensor is locked via software. This locking can only be removed via a parameter setting software.

• When parameter setting with the user interface of the ifm Container program, the values can be directly entered in the specified fields.

• For IO-Link parameter setting → device-specific parameter lists at: www.ifm.com

• Change from menu level 1 to menu level 2:
  ▶ Press [Mode/Enter] until [EF] is displayed.
  ▶ Press [Set] briefly

> The first parameter of the submenu is displayed (here: [Uni]).
If the menu level 2 is protected by an access code, "Cod1" flashes in the display.
▶ Press [Set] and keep it pressed until the valid code no. is displayed.
On delivery by ifm electronic: no access restriction.

• Locking / unlocking
The unit can be locked electronically to prevent unintentional settings.

▶ Make sure that the unit is in the normal operating mode.
▶ Press [Mode/Enter] + [Set] for 10 s.
> [Loc] is displayed.

During operation: [Loc] is briefly displayed if you try to change parameter values.

For unlocking:
▶ Press [Mode/Enter] + [Set] for 10 s.
> [uLoc] is displayed.

On delivery: unlocked.
• Timeout:

If no button is pressed for 15 s during parameter setting, the unit returns to the operating mode with unchanged values.

9.2 Configure display (optional)

► Select [Uni] and set the unit of measurement:
- [bAr], [mbAr].
- [MPA], [kPA].
- [PSI] (only PI2793, PI2794, PI2795, PI2796, PI2797, PI2799).
- [InHO] (only PI2789, PI2796, PI2797, PI2798, PI2799).
- [mWS] (only PI2796, PI2797, PI2799).
- [mmWS] (only PI2789 and PI2798).

► Select [SELd] and set type of indication:
- [P]: system pressure in the unit set in Uni.
- [P%]: system pressure in % of the set scaling of the analogue output; the following applies: 0% = ASP value / 100% = AEP value. If OU2 has been configured as switching output, [ASP] and [AEP] are not active. In this case the following applies: 0% = initial value of the measuring range/ 100% = final value of the measuring range. If [SELd] = [P%] please take the following into account: “0” does not mean that no pressure is applied to the system!

► Select [diS] and set the update rate and orientation of the display:
- [d1]: update of the measured values every 50 ms.
- [d2]: update of the measured values every 200 ms.
- [d3]: update of the measured values every 600 ms.
- [rd1], [rd2], [rd3]: display as for d1, d2, d3; rotated by 180°
- [OFF] = The measured value display is deactivated in the Run mode. Touching one of the buttons indicates the current measured value for 15 s. Pressing the [Mode/Enter] button again activates the display mode. The LEDs remain active even if the display is deactivated. Error messages are displayed even if the display is deactivated.

9.3 Set output signals

9.3.1 Set output functions

► Select [OU1] and set the switching function:
- [Hno] = hysteresis function/NO,
- [Hnc] = hysteresis function/NC,
- [Fno] = window function/NO,
- [Fnc] = window function/NC.
Select [OU2] and set the function:
- [Hno] = hysteresis function/NO,
- [Hnc] = hysteresis function/NC,
- [Fno] = window function/NO,
- [Fnc] = window function/NC.
- [I] = current signal proportional to pressure 4…20 mA.
- [InEG] = current signal proportional to pressure 20…4 mA.

### 9.3.2 Set switching limits

Select [SP1] / [SP2] and set the value at which the output switches.

Select [rP1] / [rP2] and set the value at which the output switches back. rPx is always smaller than SPx. The unit only accepts values which are lower than the value for SPx.

### 9.3.3 Scale analogue value for OUT2

Set the minimum pressure requested in the system.
- Press [Set] and keep it pressed.
  > Current setting value flashes.
- Release [Set] when the display stops flashing.
  > New setting value is displayed.
- Press [Mode/Enter] briefly.
  > The current system pressure is defined as start value for the analogue signal.

Set the maximum pressure requested in the system.
- Press [Set] and keep it pressed.
  > Current setting value flashes.
- Release [Set] when the display stops flashing.
  > New setting value is displayed.
- Press [Mode/Enter] briefly.
  > The current system pressure is defined as end value for the analogue signal.

ASP / AEP can only be set automatically within defined limits (→ 12.1 Setting ranges). If automatic setting is carried out at an invalid pressure value, [UL] or [OL] is displayed. After acknowledgement by [Mode/Enter] [Err] flashes, the ASP value / AEP value is not changed.
As an alternative:
► Select [ASP] and set the measured value at which 4 mA is provided (20 mA at [OU2] = [InEG]).
► Select [AEP] and set the measured value at which 20 mA is provided (4 mA at [OU2] = [InEG]).
Minimum distance between ASP and AEP = 25 % of the final value of the measuring range (turn-down 1:4).

9.4 User settings (optional)

9.4.1 Carry out zero point calibration
► Select [COF] and set a value between -5% and 5% of the final value of the measuring range. The internal measured value "0" is shifted by this value.

As an alternative: automatic adjustment of the offset in the range 0 bar ± 5%.
► Make sure that no pressure is applied to the system.
► Press [Set] and keep it pressed.
> The current offset value (in %) flashes briefly.
> The current system pressure is displayed.
► Release [SET].
► Press [Mode/Enter] briefly (= to confirm the new offset value).

9.4.2 Setting of the error behaviour of the outputs
► Select [FOU1] and set the value:
  - [On] = output 1 switches ON in case of a fault.
  - [OFF] = output 1 switches OFF in case of a fault.
  - [OU] = output 1 switches irrespective of the error as defined with the parameters SP1, rP1 and OU1.
► Select [FOU2] and set the value:
  - [On] = output 2 switches ON in case of a fault, the analogue signal goes to the upper end stop value.
  - [OFF] = output 2 switches OFF in case of a fault, the analogue signal goes to the lower end stop value.
  - [OU] = Output 2 switches irrespective of the error as defined with the parameters SP2, rP2 and OU2. The analogue signal corresponds to the measured value.

Error indications → 10.3
### 9.4.3 Set delay for the switching outputs


- Select [dS1], [dS2], [dr1] or [dr2] and set a value between 0.1 and 50 s
  (at 0.0 the delay time is not active).

<table>
<thead>
<tr>
<th>dS1</th>
<th>dS2</th>
<th>dr1</th>
<th>dr2</th>
</tr>
</thead>
</table>

### 9.4.4 Set switching logic for the switching outputs

- Select [P-n] and set [PnP] or [nPn].

### 9.4.5 Set damping for the switching signal

- Select [dAP] and set a value between 0.00 and 30.00 s; (at 0.00 [dAP] is not active).

  - dAP value = response time between pressure change and change of the switching status in seconds.
  - [dAP] influences the switching frequency: \( f_{\text{max}} = \frac{1}{2dAP} \).
  - [dAP] also has an effect on the display.

### 9.4.6 Set damping for the analogue signal

- Select [dAA] and set a value between 0.01 and 99.99 s; (at 0.00 [dAA] is not active).

  - dAA value = response time between pressure change and change of the analogue signal in seconds.

### 9.4.7 Calibrate curve of measured values

- Set a defined reference pressure between ASP and AEP in the system.
- Select [CAL].
- Press [Set] briefly.
  - [CP1] is displayed.
- Press [Set] for 5 s.
  - The pressure measured by the unit is displayed.
- Press [Set] until the set reference pressure is indicated (measured pressure = reference pressure) or the corresponding analogue signal is provided on OUT2.
  - Maximum correction value = \( \pm 2 \% \) of the final value of the measuring range.
- Press [Mode/Enter] briefly.
  - [CP1] is displayed.
- Press [Mode/Enter] briefly.
  - [CP2] is displayed.
  - Continue with a) or b)
a) Finish calibration:
> [CAL] is displayed.
b) Change a 2nd point on the curve of measured values
► Set a second defined reference pressure in the system.
  Minimum distance between the calibration points CP1 and CP2 = 5% of the final value of the measuring range.
► Press [Set] for 5 s.
> The pressure measured by the unit is displayed.
► Press [Set] until the set reference pressure is indicated (measured pressure = reference pressure) or the corresponding analogue signal is provided on OUT2.
  Maximum correction value = ±2% of the final value of the measuring range.
> [CP2] is displayed.
> [CAL] is displayed, the process is finished.

9.5 Service functions

9.5.1 Read min/max values for system pressure
► Select [HI] or [LO] and press [Set] briefly.
[H] = maximum value, [LO] = minimum value.
Delete memory:
► Select [HI] or [LO].
► Press [Set] and keep it pressed until [----] is displayed.

9.5.2 Reset all parameters to factory setting
► Select [rES].
► Press [Set] and keep it pressed until [----] is displayed.
It is recommended to take down your own settings in the table before carrying out a reset (→13 Factory setting).

9.6 Simulation function

9.6.1 Open menu level 3 (simulation)
► Select [EF] and press [Set] briefly (= to open menu level 2).
► Select [SIM] and press [Set] briefly (= to open menu level 3).
> [SEL] is displayed.
9.6.2 Set simulation value

**Output states**

If [SEL] is active:
- Press [Set] and keep it pressed until [OU] is displayed.
- Press [Mode/Enter] briefly.
  > [S.OU1] is displayed (in 2-wire operation [S.OU2] is displayed).
- Press [Set] to set the requested value:
  - [OPEN] = output 1 not active / open.
  - [CLOS] = output 1 active / closed.
- Press [Mode/Enter] briefly.
  > [S.OU2] is displayed.
- Press [Set] to set the requested value:
  - If [OU2] = [Hnc], [Hno], [Fnc] or [Fno] (not in 2-wire operation):
    - [OPEN] = output 2 not active / open.
    - [CLOS] = output 2 active / closed.
  - If [OU2] = [I] or [InEG]:
    - 3.60...21.10 mA in steps of 0.01 mA.
- Press [Mode/Enter] briefly.

**Process value**

If [SEL] is active:
- Press [Set] and keep it pressed until [Proc] is displayed.
- Press [Mode/Enter] briefly.
  > [S.Pr] is displayed.
- Press [Set] to set the requested pressure value.
- Press [Mode/Enter] briefly.

9.6.3 Set time for simulation

- Select [S.TIM] and set the value between 1...60 minutes.

9.6.4 Start simulation

- Select [S.ON].
- Press [Set] and keep it pressed until the display alternately shows [SIM] and the current operation indication.
  Current operation indication:
  - Current system pressure if [SEL] = [OU].
  - Simulated measured value set in [S.Pr] if [SEL] = [Proc].
After the simulation time has elapsed [S.OFF] is displayed for 2 s, then [SEL].

Abort simulation:
- Press [Mode/Enter] or [Set] briefly.
  > [S.OFF] is displayed for 2 s, then [SEL].
10 Operation

After power on, the unit is in the Run mode (= normal operating mode). It carries out its measurement and evaluation functions and provides output signals according to the set parameters.

Operating indicators → Chapter 7 Operating and display elements.

10.1 Read set parameters

► Press [Mode/Enter] until the requested parameter is displayed.
► Press [Set] briefly.
> The unit displays the corresponding parameter value for approx. 15 s. After another 15 s the parameter is displayed again, then the unit returns to the Run mode.

10.2 Change the display in the Run mode

► Press [Set] briefly in the Run mode.
> The unit indicates the current measured value in the selected type of indication for approx. 15 s:
  - System pressure in the unit set in Uni.
  - System pressure in % of the set scaling of the analogue output if [OU2] is configured as analogue output.
  - System pressure in % of the final value of the measuring range if [OU2] is configured as switching output.

10.3 Self-diagnosis / error indications

The unit has many self-diagnostic options.
• It monitors itself automatically during operation.
• It indicates warnings and faults via IO-Link and via display (even if the display is deactivated).
• If a fault is found, the outputs are set according to the set parameters FOU1 and FOU2 (→ 9.4.2).
<table>
<thead>
<tr>
<th>Display</th>
<th>IO-Link event number</th>
<th>IO-Link PDValid</th>
<th>IO-Link Device-Status Idx 36</th>
<th>Type of fault</th>
<th>Corrective measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>-/-*</td>
<td>0x5111</td>
<td>no</td>
<td>2**</td>
<td>Supply voltage too low.</td>
<td>▶ Check / correct the supply voltage. ▶ In 2-wire operation: Check / correct the connected load.</td>
</tr>
<tr>
<td>SC1</td>
<td>0x8CB3</td>
<td>yes</td>
<td>2**</td>
<td>Excessive current switching output 1.</td>
<td>▶ Check switching output 1 for short-circuit or excessive current; remove the fault.</td>
</tr>
<tr>
<td>SC2</td>
<td>0x8CB4</td>
<td>yes</td>
<td>2**</td>
<td>Excessive current switching output 2.</td>
<td>▶ Check switching output 2 for short-circuit or excessive current; remove the fault.</td>
</tr>
<tr>
<td>Para</td>
<td>0x1810/0x1Fxx</td>
<td>no</td>
<td>2**</td>
<td>Parameter setting fault via IO-Link; setting of one parameter outside the permitted area.</td>
<td>▶ Define the parameters via IO-Link event number 0x1Fxx. ▶ Change parameters via IO-Link or setting buttons. ▶ Reset all parameters to factory setting (→ 9.5.2).</td>
</tr>
<tr>
<td>OL</td>
<td>0x8C10</td>
<td>yes</td>
<td>2**</td>
<td>Process value too high.</td>
<td>▶ Check / reduce system pressure.</td>
</tr>
<tr>
<td>UL</td>
<td>0x8C30</td>
<td>yes</td>
<td>2**</td>
<td>Process value too low.</td>
<td>▶ Check / increase the system pressure.</td>
</tr>
<tr>
<td>E100</td>
<td>0x5000</td>
<td>no</td>
<td>4**</td>
<td>Internal sensor error detected.</td>
<td>▶ Replace the unit.</td>
</tr>
<tr>
<td>W531</td>
<td>0x8CA1</td>
<td>yes</td>
<td>2**</td>
<td>Analogue output at the upper limit (20.5 mA).</td>
<td>▶ Increase AEP value if possible (for [OU2] = [InEG] ASP value) or reduce system pressure.</td>
</tr>
<tr>
<td>W530</td>
<td>0x8CA0</td>
<td>yes</td>
<td>2**</td>
<td>Analogue output at the lower limit (3.8 mA).</td>
<td>▶ Reduce ASP value if possible (for [OU2] = [InEG] AEP value) or increase system pressure.</td>
</tr>
</tbody>
</table>

* In case of undervoltage (fault no. W403) the display shows nothing
** 2 = Out of Spec / 4 = Failure
<table>
<thead>
<tr>
<th>Display</th>
<th>IO-Link event number</th>
<th>IO-Link PDValid</th>
<th>IO-Link Device-Status idx 36</th>
<th>Type of fault</th>
<th>Corrective measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>W532</td>
<td>0x8CA5</td>
<td>yes</td>
<td>2**</td>
<td>Load at analogue output too high.***</td>
<td>► Reduce load at output 2 or increase the supply voltage.</td>
</tr>
<tr>
<td>W203</td>
<td>0x1822</td>
<td>yes</td>
<td>2**</td>
<td>Error during the temperature compensation of the pressure measurement.</td>
<td>The unit uses a higher temperature coefficient (i.e. with reduced accuracy). ► Replace the unit.</td>
</tr>
<tr>
<td>W703</td>
<td>0x8CC2</td>
<td>yes</td>
<td>2**</td>
<td>Medium temperature too high (&gt; 150 °C).</td>
<td>Reduce the medium temperature.</td>
</tr>
<tr>
<td>W704</td>
<td>0x8CC3</td>
<td>yes</td>
<td>2**</td>
<td>Medium temperature too low (&lt; -30 °C).</td>
<td>Increase the medium temperature.</td>
</tr>
<tr>
<td>W161</td>
<td>0x4210</td>
<td>yes</td>
<td>2**</td>
<td>Unit temperature too high (&gt; 90 °C).</td>
<td>Unit outside the specification. ► Do not insulate the installation.</td>
</tr>
<tr>
<td>W162</td>
<td>0x4220</td>
<td>yes</td>
<td>2**</td>
<td>Unit temperature too low (&lt; -30 °C).</td>
<td>Unit outside the specification. ► Insulate the installation.</td>
</tr>
</tbody>
</table>

* In case of undervoltage (fault no. W403) the display shows nothing
** 2 = Out of Spec / 4 = Failure
*** This message is only displayed for 3-wire operation. For 2-wire operation undervoltage is detected and displayed. If OU2 is not used for the application, the message can be suppressed by defining a switching function for OU2 (→ 9.3.1).
## 11 Scale drawing

[Scale drawing image]

Dimensions in mm
1: Display
2: LEDs
3: Programming button

## 12 Technical data

<table>
<thead>
<tr>
<th></th>
<th>2-wire operation</th>
<th>3-wire operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage [V]</td>
<td>20...32 DC</td>
<td>18...32 DC</td>
</tr>
<tr>
<td>Current consumption [mA]</td>
<td>3.6...21</td>
<td>&lt; 45</td>
</tr>
<tr>
<td>Current rating [mA]</td>
<td>---</td>
<td>250</td>
</tr>
<tr>
<td>Analogue output</td>
<td>4...20 mA / 20...4 mA</td>
<td></td>
</tr>
<tr>
<td>Max. load [Ω]</td>
<td>300</td>
<td>(Ub - 10) x 50</td>
</tr>
<tr>
<td>Step response time analogue output [ms]</td>
<td>45</td>
<td>7</td>
</tr>
<tr>
<td>Voltage drop [V]</td>
<td>---</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>Min. response time switching output [ms]</td>
<td>---</td>
<td>3</td>
</tr>
<tr>
<td>Switching frequency [Hz]</td>
<td>---</td>
<td>125</td>
</tr>
<tr>
<td>Power-on delay time [s]</td>
<td>1</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Short-circuit protection; reverse polarity protection / overload protection, integrated watchdog
IO-Link Device
Transfer type ..................................................................................... COM2 (38.4 kBaud)

Accuracy / deviations (in % of the span)¹)

<table>
<thead>
<tr>
<th></th>
<th>PI279x</th>
<th>PI2789</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch point accuracy [%]</td>
<td>&lt; ± 0.2</td>
<td>&lt; ± 0.5</td>
</tr>
<tr>
<td>Characteristics deviation (linearity, incl. hysteresis and repeatability)²)</td>
<td>&lt; ± 0.2</td>
<td>&lt; ± 0.5</td>
</tr>
<tr>
<td>Linearity</td>
<td>&lt; ± 0.15</td>
<td>&lt; ± 0.25</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>&lt; ± 0.15</td>
<td>&lt; ± 0.2</td>
</tr>
<tr>
<td>Repeatability (in case of temperature fluctuations &lt; 10 K)</td>
<td>&lt; ± 0.1</td>
<td>&lt; ± 0.1</td>
</tr>
<tr>
<td>Long-term stability (in % of the span per year)</td>
<td>&lt; ± 0.1</td>
<td>&lt; ± 0.1</td>
</tr>
</tbody>
</table>

Temperature coefficients (TC) in the compensated temperature range 0 ... 70°C (in % of the span per 10 K)

<table>
<thead>
<tr>
<th></th>
<th>PI279x</th>
<th>PI2789</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greatest TEMPCO of the zero point</td>
<td>&lt; ± 0.05</td>
<td>&lt; ± 0.1</td>
</tr>
<tr>
<td>Greatest TEMPCO of the span</td>
<td>&lt; ± 0.15</td>
<td>&lt; ± 0.2</td>
</tr>
</tbody>
</table>

Materials (wetted parts)
......................................................... stainless steel 316L / 1.4435, surface characteristics: Ra < 0.4 / Rz 4

ceramics (99.9 % Al2O3); PTFE

Housing materials........ high-grade stainless steel (316L/1.4404); FPM (Viton); PTFE; PBT (Pocan); PEI; PFA

Protection rating ................................................................. IP 67 / IP 68 / IP 69K

Protection class ........................................................................... III

Insulation resistance [MΩ]...................................................................... > 100 (500 V DC)

Shock resistance [g]........................................................................ 50 (DIN IEC 68-2-27, 11 ms)

Vibration resistance [g]................................................................... 20 (DIN IEC 68-2-6, 10 - 2000 Hz)

Switching cycles min. .................................................................... 100 million

Ambient temperature [°C].................................................................. -25 .. 80

Medium temperature [°C].................................................................. -25 .. 125 (145 max. 1 h)

Storage temperature [°C].................................................................. -40 .. 100

EMC EN 61000-4-2 ESD: ................................................................. 4 / 8 kV

EN 61000-4-3 HF radiated: ............................................................ 10 V/m

EN 61000-4-4 Burst: ........................................................................ 2 kV

EN 61000-4-5 Surge: ....................................................................... 0.5 / 1 kV

EN 61000-4-6 HF conducted: ......................................................... 10 V

¹) All indications are referred to a turn-down of 1:1

²) Limit value setting to DIN 16086
## 12.1 Setting ranges

<table>
<thead>
<tr>
<th></th>
<th>SP1 / SP2</th>
<th>rP1 / rP2</th>
<th>ASP</th>
<th>AEP</th>
<th>ΔP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>min</td>
<td>max</td>
<td>min</td>
<td>max</td>
<td></td>
</tr>
<tr>
<td>mbar</td>
<td>-4.8</td>
<td>100.0</td>
<td>-5.0</td>
<td>99.8</td>
<td>-5.0</td>
</tr>
<tr>
<td>kPa</td>
<td>-0.48</td>
<td>10.00</td>
<td>-0.50</td>
<td>9.98</td>
<td>-0.50</td>
</tr>
<tr>
<td>inH₂O</td>
<td>-1.92</td>
<td>40.16</td>
<td>-2.00</td>
<td>40.08</td>
<td>-2.00</td>
</tr>
<tr>
<td>mmWS</td>
<td>-49</td>
<td>1020</td>
<td>-51</td>
<td>1018</td>
<td>-51</td>
</tr>
<tr>
<td>bar</td>
<td>-0.96</td>
<td>25.00</td>
<td>-1.00</td>
<td>24.96</td>
<td>-1.00</td>
</tr>
<tr>
<td>PSI</td>
<td>-13.8</td>
<td>362.7</td>
<td>-14.4</td>
<td>362.1</td>
<td>-14.4</td>
</tr>
<tr>
<td>MPA</td>
<td>-0.096</td>
<td>2.500</td>
<td>-0.100</td>
<td>2.496</td>
<td>-0.100</td>
</tr>
<tr>
<td>bar</td>
<td>-0.98</td>
<td>10.00</td>
<td>-1.00</td>
<td>9.98</td>
<td>-1.00</td>
</tr>
<tr>
<td>PSI</td>
<td>-14.2</td>
<td>145.0</td>
<td>-14.5</td>
<td>144.7</td>
<td>-14.5</td>
</tr>
<tr>
<td>MPA</td>
<td>-0.098</td>
<td>1.000</td>
<td>-0.100</td>
<td>0.998</td>
<td>-0.100</td>
</tr>
<tr>
<td>bar</td>
<td>-0.990</td>
<td>4.000</td>
<td>-1.000</td>
<td>3.990</td>
<td>-1.000</td>
</tr>
<tr>
<td>PSI</td>
<td>-14.35</td>
<td>58.00</td>
<td>-14.50</td>
<td>57.85</td>
<td>-14.50</td>
</tr>
<tr>
<td>kPa</td>
<td>-99.0</td>
<td>400.0</td>
<td>-100.0</td>
<td>399.0</td>
<td>-100.0</td>
</tr>
<tr>
<td>bar</td>
<td>-0.120</td>
<td>2.500</td>
<td>-0.124</td>
<td>2.496</td>
<td>-0.124</td>
</tr>
<tr>
<td>PSI</td>
<td>-1.74</td>
<td>36.27</td>
<td>-1.80</td>
<td>36.21</td>
<td>-1.80</td>
</tr>
<tr>
<td>kPa</td>
<td>-12.0</td>
<td>250.0</td>
<td>-12.4</td>
<td>249.6</td>
<td>-12.4</td>
</tr>
<tr>
<td>inH₂O</td>
<td>-48</td>
<td>1004</td>
<td>-50</td>
<td>1002</td>
<td>-50</td>
</tr>
<tr>
<td>mWS</td>
<td>-1.22</td>
<td>25.49</td>
<td>-1.26</td>
<td>25.45</td>
<td>-1.26</td>
</tr>
<tr>
<td>mbar</td>
<td>-48</td>
<td>1000</td>
<td>-50</td>
<td>998</td>
<td>-50</td>
</tr>
<tr>
<td>PSI</td>
<td>-0.70</td>
<td>14.50</td>
<td>-0.73</td>
<td>14.47</td>
<td>-0.73</td>
</tr>
<tr>
<td>kPa</td>
<td>-4.8</td>
<td>100.0</td>
<td>-5.0</td>
<td>99.8</td>
<td>-5.0</td>
</tr>
<tr>
<td>inH₂O</td>
<td>-19.2</td>
<td>401.6</td>
<td>-20.0</td>
<td>400.8</td>
<td>-20.0</td>
</tr>
<tr>
<td>mWS</td>
<td>-0.49</td>
<td>10.20</td>
<td>-0.51</td>
<td>10.18</td>
<td>-0.51</td>
</tr>
<tr>
<td>mbar</td>
<td>-12.0</td>
<td>250.0</td>
<td>-12.4</td>
<td>249.6</td>
<td>-12.4</td>
</tr>
<tr>
<td>kPa</td>
<td>-1.20</td>
<td>25.00</td>
<td>-1.24</td>
<td>24.96</td>
<td>-1.24</td>
</tr>
<tr>
<td>inH₂O</td>
<td>-4.8</td>
<td>100.4</td>
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<td>100.2</td>
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**ΔP = step increment**
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ΔP = step increment

More information at www.ifm.com
### 13 Factory setting

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<th>User setting</th>
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* = the indicated percentage of the final value of the measuring range (VMR) of the respective sensor (for PI2799 the percentage of the measuring span) is set.